

WHAT IS CLAIMED IS:

1. A network device connected to a network and having a plurality of controllers, comprising:
  - 5 a plurality of databases disposed in distributed fashion on respective ones of the plurality of controllers and storing management information relating to respective ones of the controllers; and
  - 10 a plurality of agents distributed on the plurality of controllers;

wherein each of the plurality of agents has means for communicating with one another, means for executing distributed processing of messages issued from a network manager, and means for generating responses to these messages.

- 15 2. The network device according to claim 1, wherein at least one agent among the plurality thereof functions as a master agent and the other agents function as subagents; and
- 20 each of said agents communicates with one another using a network manager that manages the network, and a protocol for management information exchange between the network manager and said network device.
- 25 3. The network device according to claim 2, wherein said master agent includes:

means for separating a message issued from a network manager into a first message containing

management information to be processed by the master agent and a second message containing management information other than said management information to be processed;

5        response generating means for generating response information with regard to the first message; and means for notifying subagents of the second message.

4.    The network device according to claim 3, wherein  
10    said master agent includes:

      means for receiving response messages sent back from said subagents;

      reconstruction means for reconstructing a response message, which is to be sent back to the network  
15    manager, from the response messages and the response information that has been generated by said response generating means; and

      means for sending the response message, which has been reconstructed by said reconstruction means, back to  
20    said network manager.

5.    The network device according to claim 2, wherein  
each subagent includes:

      means for separating a second message, which has been received from said master agent, into a third  
25    message containing management information to be processed by the subagent and a fourth message

containing management information other than said management information to be processed;

response generating means for generating response information with regard to the third message; and

5 means for notifying other subagents of the fourth message.

6. A method of controlling a network device connected to a network and having a plurality of controllers, comprising the steps of:

10 disposing a plurality of databases in distributed fashion on respective ones of the plurality of controllers, said databases storing management information relating to respective ones of the controllers; and

15 allowing a plurality of agents distributed on the plurality of controllers to communicate with one another, thereby executing distributed processing of messages issued from a network manager and generating responses to these messages.

20 7. The method according to claim 6, wherein at least one agent among the plurality thereof functions as a master agent and the other agents function as subagents; and

each of said agents communicates with one another

25 using a network manager that manages the network, and a protocol for management information exchange between the network manager and said network device.

8. The network device according to claim 7, wherein  
said master agent:

separates a message issued from a network manager  
into a first message containing management information  
5 to be processed by the master agent, and a second  
message containing management information other than  
said management information to be processed;

generates response information with regard to the  
first message; and

10 notifies subagents of the second message.

9. The method according to claim 8, wherein said master  
agent:

receives response messages sent back from said  
subagents;

15 reconstructs a response message, which is to be  
sent back to the network manager, from the response  
messages and the response information that has been  
generated; and

sends the reconstructed response message to said  
20 network manager.

10. The method according to claim 8, wherein each  
subagent:

separates a second message, which has been received  
from said master agent, into a third message containing  
25 management information to be processed by the subagent  
and a fourth message containing management information  
other than said management information to be processed;

generates response information with regard to the third message; and

notifies other subagents of the fourth message.

11. A computer program for implementing, by computer, a master agent which includes:

means for separating a message issued from a network manager into a first message containing management information to be processed, and a second message containing management information other than said management information to be processed;

response generating means for generating response information with regard to the first message; and

means for notifying a peripheral device of the second message.

15 12. The computer program according to claim 11, wherein said master agent further includes:

means for receiving a response message sent back from said peripheral device;

reconstruction means for reconstructing a response message, which is to be sent back to the network manager, from the response message and the response information that has been generated by said response generating means; and

means for sending the response message, which has been reconstructed by said reconstruction means, back to said network manager.

13. A computer program for implementing, by computer:

means for separating a message received from a controller into a first message containing management information to be processed and a second message containing management information other than said management information to be processed;

response generating means for generating response information with regard to the first message; and

means for notifying other subagents of the second message.

10 14. A computer-readable storage medium storing a computer program for implementing, by computer, a master agent which includes:

means for separating a message issued from a network manager into a first message containing management information to be processed, and a second message containing management information other than said management information to be processed;

response generating means for generating response information with regard to the first message; and

20 means for notifying a peripheral device of the second message.

15. The computer-readable storage medium according to claim 14, wherein said master agent further includes:

means for receiving a response message sent back 25 from said peripheral device;

reconstruction means for reconstructing a response message, which is to be sent back to the network

manager, from the response message and the response information that has been generated by said response generating means; and

means for sending the response message, which has  
5 been reconstructed by said reconstruction means, back to  
said network manager.

16. A computer-readable storage medium storing a  
computer program for implementing, by computer:

means for separating a message received from a  
10 controller into a first message containing management  
information to be processed and a second message  
containing management information other than said  
management information to be processed;

response generating means for generating response  
15 information with regard to the first message; and

means for notifying other subagents of the second  
message.

17. A network controller connected to a peripheral  
device and to a communication line, comprising:

20 receiving means for receiving data from a  
management apparatus via the communication line;

discriminating means for discriminating the data,  
which has been received by said receiving means, as data  
to be processed by the network controller and data to be  
25 processed by the peripheral device; and

processing means for sending the peripheral device,  
and causing the peripheral device to process, data that

5        said discriminating means has discriminated as being data to be processed by the peripheral device, and for processing data that said discriminating means has discriminated as being data to be processed by the network controller.

18. The network controller according to claim 17, further comprising holding means for holding information relating to the network controller, wherein said processing means processes the data using the information held by said holding means.

19. The network controller according to claim 17, further comprising connecting means capable of being connected to a plurality of peripheral devices, wherein said discriminating means discriminates, with regard to each connected peripheral device, data to be transmitted to and processed by said peripheral device.

20. A peripheral device connected to a communication line via the network controlled set forth in claim 8, comprising:

20        receiving means for receiving data from a management apparatus via said network controller; and processing means for processing data, which has been received by said receiving means, upon referring to a database holding information relating to said peripheral device.

21. A method of controlling a network controller connected to a peripheral device and to a communication line, comprising:

5           a receiving step of receiving data from a management apparatus via the communication line;

10           a discriminating step of discriminating the data, which has been received at said receiving step, as data to be processed by the network controller and data to be processed by the peripheral device; and

15           a processing step of sending the peripheral device, and causing the peripheral device to process, data that said discriminating step has discriminated as being data to be processed by the peripheral device, and for processing data that said discriminating step has discriminated as being data to be processed by the network controller.

22. The method according to claim 21, further comprising a holding step of holding information relating to the network controller, wherein said processing step processes the data using the information held at said holding step.

23. The method according to claim 21, wherein said discriminating step discriminates, with regard to each connected peripheral device, data to be transmitted to and processed by said peripheral device.

24. A computer program for implementing control in a network controller connected to a peripheral device and to a communication line, comprising:

    a receiving step of receiving data from a  
5 management apparatus via the communication line;  
    a discriminating step of discriminating the data, which has been received at said receiving step, as data to be processed by the network controller and data to be processed by the peripheral device; and  
10     a processing step of sending the peripheral device, and causing the peripheral device to process, data that said discriminating step has discriminated as being data to be processed by the peripheral device, and for processing data that said discriminating step has  
15 discriminated as being data to be processed by the network controller.

25. The computer program according to claim 24, further comprising a holding step of holding information relating to the network controller, wherein said  
20 processing step processes the data using the information held at said holding step.

26. The computer program according to claim 24, wherein said discriminating step discriminates, with regard to each connected peripheral device, data to be transmitted  
25 to and processed by said peripheral device.

27. A computer-readable storage medium storing a computer program for implementing control in a network

controller connected to a peripheral device and to a communication line, said program comprising:

    a receiving step of receiving data from a management apparatus via the communication line;

5       a discriminating step of discriminating the data, which has been received at said receiving step, as data to be processed by the network controller and data to be processed by the peripheral device; and

10      a processing step of sending the peripheral device, and causing the peripheral device to process, data that said discriminating step has discriminated as being data to be processed by the peripheral device, and for processing data that said discriminating step has discriminated as being data to be processed by the 15 network controller.

28. The storage medium according to claim 27, wherein said program further comprises a holding step of holding information relating to the network controller, wherein said processing step processes the data using the 20 information held at said holding step.

29. The storage medium according to claim 27, wherein said discriminating step discriminates, with regard to each connected peripheral device, data to be transmitted to and processed by said peripheral device.

25 30. A network device connected to a communication line and including a network controller and a peripheral processing unit, said network controller having:

receiving means for receiving data from a management apparatus via the communication line;

discriminating means for discriminating the data, which has been received by said receiving means, as data to be processed by the network controller and data to be processed by the peripheral processing unit; and

10 first processing means for sending the peripheral processing unit, and causing said peripheral processing unit to process, data that said discriminating means has discriminated as being data to be processed by the peripheral processing unit, and for processing data that said discriminating means has discriminated as being data to be processed by the network controller; and

15 said peripheral processing unit has:

receiving means for receiving data that said discriminating means has discriminated as being data to be processed by said peripheral processing unit; and

20 second processing means for processing data, which has been received by said receiving means, upon referring to a database holding information relating to the peripheral processing unit.

31. The network device according to claim 30, further comprising holding means for holding information relating to the network controller per se, wherein said 25 first processing means processes the data using the information held by said holding means.

32. The network device according to claim 30, further comprising means capable of being connected to a plurality of peripheral processing units, wherein said discriminating means discriminates, with regard to each 5 connected peripheral processing unit, data to be transmitted to and processed by said peripheral processing unit.

33. A device controller externally connected at two ends, comprising:

10        a database;  
means which, if a message received from upstream contains management information corresponding to an entry in said database, is for generating response information by processing the management information in 15 accordance with the message;

means which, if the message contains other management information, is for generating a second message containing this management information and transmitting the second message downstream; and

20        means for reconstructing a response message by combining the response information with the second message received from downstream, and transmitting the response message upstream.

34. A controller method for a device externally connected at two ends, comprising the step of:

if a message received from upstream contains management information corresponding to an entry in a

database, generating response information by processing the management information in accordance with the message;

if the message contains other management  
5 information, generating a second message containing this management information and transmitting the second message downstream;

reconstructing a response message by combining the response information with the second message received  
10 from downstream; and

transmitting the response message upstream.

35. A computer program, which uses a database, for implementing by computer:

means which, if a message received from upstream  
15 contains management information corresponding to an entry in said database, is for generating response information by processing the management information in accordance with the message;

means which, if the message contains other  
20 management information, is for generating a second message containing this management information and transmitting the second message downstream; and

means for reconstructing a response message by combining the response information with the second  
25 message received from downstream, and transmitting the response message upstream.